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09/632,809	08/04/2000	Akio Yamamoto	10991362-2	2510

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EXAMINER	
THOMPSON, JAMES A	
ART UNIT	**PAPER NUMBER**
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/632,809	Applicant(s) YAMAMOTO, AKIO	
	Examiner James A Thompson	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 January 2005 and 26 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-17,19 and 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-17,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 August 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments dated 11 November 2004 have been fully considered and are addressed in detail in the Advisory Action dated 27 December 2004.

Response to Amendment

2. Examiner notes that in page 2, line 2 of the claim amendments, Applicant states "[p]lease cancel claims 2, 9, 10, and 18..." but later recites the original claim 9. Does Applicant wish to cancel claim 9? If so, then the current recitation of claim 9 should be changed to "9. (cancelled)" instead of listing the claim. If not, then the text of page 2, line 2 should be modified.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3, 6-8, 12, 15-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lathrop (US Patent 5,097,427) in view of Curry (US Patent 5,696,604).

Claim 1 discloses an image processing method. Claim 12 discloses an image processing system. The system of claim 12

performs the method of claim 1. Claim 20 discloses a computer-readable medium carrying instructions for performing the method of claim 1. Claims 1, 12 and 20 are therefore discussed together.

Claims 6-8 and 15-17 respectively disclose the same limitations. Claims 6-8 and 15-17 are therefore respectively discussed together.

Regarding claims 1, 12 and 20: Lathrop discloses an image processing system (figure 1 of Lathrop) comprising a processor (figure 1(4) of Lathrop) programmed to warp an initial line pattern (figure 2 and column 4, line 64 to column 5, line 2 of Lathrop) based upon pixel values of the original image (column 4, lines 60-63 of Lathrop) and a comparison of original image pixel values and warped line pixel values (column 5, lines 57-60 and column 6, lines 60-64 of Lathrop) to produce a warped line pattern (column 5, line 68 to column 6, line 7 of Lathrop), and to map an original image onto the warped line pattern (figure 2 and column 5, lines 57-60 of Lathrop) to produce a halftone image (column 5, lines 36-39 of Lathrop).

Said processor generates texture table parameters U and V (column 4, lines 64-66 of Lathrop), both of which are functions of coordinate values X and Y (column 4, line 67 to column 5, line 2 of Lathrop), and their corresponding derivatives with respect to both coordinate values X and Y (column 4, lines 66-67 of Lathrop). Said texture table parameter values are first mapped onto the object space of the image (figure 2(a-c) and column 5, lines 57-60 of Lathrop). Defining a texture pattern in UV-space (column 6, lines 60-64 of Lathrop) and mapping said pattern onto object space is the same as warping an initial line to produce a warped line pattern, since said texture pattern is

ultimately warped with respect to XY-space used for the image (figure 2(a-c) and column 5, line 68 to column 6, line 7 of Lathrop). Said object space is defined by three-dimensional coordinates (figure 2b and column 5, lines 66-68 of Lathrop).

The image display space is a two-dimensional space (figure 2c and column 6, lines 4-7 of Lathrop). The shape of said object space inherently alters the pixel values in said image display space since the shape of said object space must be mapped to the two-dimensional image display space to form a two-dimensional image (column 5, line 68 to column 6, line 7 of Lathrop). If the texture from said texture space is a unit value rectangle, which would therefore not alter the image at all, then the resultant image does not change. The resultant image in this case is the original image, which would be the pixel values depicting an image with a particular three-dimensional shape. For a texture space that contains non-unit values, then the resultant image is changed. Since said texture space is warped across said object space (column 5, line 68 to column 6, line 2 of Lathrop), then the initial line pattern is therefore warped based upon pixel values of the original image. Further, said derivatives are also comparison values between the original image pixel values and the warped line pixel values since said derivatives are measures of how much the original pixel values change when mapped from the original two-dimensional space (figure 2a of Lathrop) to the final two-dimensional space (figure 2b of Lathrop). Therefore, said warping is also performed based on a comparison of original image pixel values and warped line pixel values. Said processor is further programmed to map an original image onto said warped line pattern (figure 2(a-c) and column 5, lines 57-60 of

Lathrop). Said texture pattern is mapped from the object space to the image space (column 5, line 66 to column 6, line 7 of Lathrop), producing a textured image (figure 2c of Lathrop).

Further regarding claim 20, Lathrop discloses the use of computational and storage resources (column 7, line 63 to column 8, line 2 of Lathrop). "Storage resources" would inherently be some form of computer-readable medium since computer graphics computations are to be performed (column 7, line 67 to column 8, line 2 of Lathrop). Performing computations on a computer inherently requires instructions in some form on said computer-readable medium.

Lathrop does not disclose expressly producing an engraving-style halftone image by said warping and mapping.

Curry discloses producing a computer-generated engraving plate (column 3, lines 64-66 of Curry), which is formed from halftone data (column 3, lines 60-65 of Curry).

Lathrop and Curry are combinable because they are from the same field of endeavor, namely digital image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to warp the image based on a texture, as taught by Lathrop, in the form of the halftone pattern that would be required to make an engraving plate, as taught by Curry. The motivation for doing so would have been to provide a desired texture pattern that can then be stored and selected for use in the system taught by Lathrop (column 2, lines 66-68 of Lathrop). Therefore, it would have been obvious to combine Curry with Lathrop to obtain the invention as specified in claims 1, 12 and 20.

Regarding claim 3: Lathrop discloses that the texture lookup table module (figure 5(30) of Lathrop) stores multiple

texture lookup tables (column 5, lines 5-7 of Lathrop) and utilizes a MAP SELECT signal generated by the map selector module (figure 5(28) of Lathrop) (column 5, lines 7-12 of Lathrop). One example texture pattern is a rectangular grid (figure 2a and column 5, lines 61-63 of Lathrop). Two other texture patterns are shown in figure 4 of Lathrop, the texture used in each section of the image determined by a texture mapped flag (column 6, lines 17-20 of Lathrop). Both of the texture patterns shown in figure 4 of Lathrop are clearly oriented substantially along an initial direction. The texture pattern shown that is comprised substantially of horizontal lines is specifically considered here (figure 4 of Lathrop). Said texture pattern is mapped onto the object space (column 5, lines 64-66 of Lathrop), thus warping said texture pattern (column 5, line 68 to column 6, line 3 of Lathrop). The rectangular grid texture pattern shown specifically in figure 2a of Lathrop is warped by said object space shown in figure 2b of Lathrop (column 5, line 64 to column 6, line 3 of Lathrop). As can clearly be seen from figure 2c of Lathrop, said warping is performed in a direction that is substantially orthogonal to the original directions of the rectangular grid. For said texture pattern that is being specifically considered here, which substantially spans the horizontal direction, this would inherently result in said texture pattern being warped substantially in the vertical direction.

Regarding claims 6 and 15: Lathrop discloses that partial derivative signals are calculated (column 4, lines 64-68 of Lathrop), said signals being a function of the pixel locations (column 4, line 68 to column 5, line 2 of Lathrop). The texture signals U and V, and their partial derivatives with respect to X

and Y, are used to generate X and Y location values for a texture look-up table (column 6, lines 61-64 of Lathrop). Since the X and Y coordinates of the image are defined by a mapping from the three-dimensional object space (column 5, line 66 to column 6, line 3 of Lathrop), the geometry of said object space inherently affects the pixel values of the two-dimensional image display space (column 6, lines 4-7 of Lathrop). The pixel values of the image display space (figure 2c of Lathrop) render in two dimensions the three-dimensional object in object space (figure 2b of Lathrop) (column 6, lines 4-7 of Lathrop). Furthermore, using the partial derivative values dU/dX, dU/dY, dV/dX and dV/dY is the same as using the gradient for a two-dimensional space, $\vec{\nabla}\psi = \frac{\partial\psi}{\partial x}\hat{e}_x + \frac{\partial\psi}{\partial y}\hat{e}_y$. Computing the X and Y values for warping the texture pattern to the image display space by using the partial derivatives dU/dX, dU/dY, dV/dX and dV/dY is therefore a warping of the initial line pattern based upon gradient information computed from the pixel values of the original image.

Regarding claims 7 and 16: Lathrop discloses that said partial derivatives are used to interpolate X and Y address values in the image display plane for corresponding pixels in the U-V texture plane (column 6, lines 60-64 of Lathrop). The operation of interpolation inherently involves a weighted averaging of neighboring values, in this case gradient values (column 6, lines 60-64 of Lathrop). Therefore, for particular pixel locations, gradient information is computed based upon a weighted averaging of gradient information (column 6, lines 60-64 of Lathrop) computed from neighboring pixel values (column 5, lines 3-5 of Lathrop).

Regarding claims 8 and 17: Lathrop discloses that texture signals U and V are used to generate X and Y location values for a texture look-up table (column 6, lines 61-64 of Lathrop). Since the X and Y coordinates of the image are defined by a mapping from the three-dimensional object space (column 5, line 66 to column 6, line 3 of Lathrop), the geometry of said object space inherently affects the pixel values of the two-dimensional image display space (column 6, lines 4-7 of Lathrop). The pixel values of the image display space (figure 2c of Lathrop) render in two dimensions the three-dimensional object in object space (figure 2b of Lathrop) (column 6, lines 4-7 of Lathrop). If a texture pattern such as the horizontal pattern shown in figure 4 of Lathrop is used, then computing the X values (X being the horizontal direction) for warping the texture pattern to said image display space is a warping of the initial line pattern based upon a set of displacement values computed for pixel locations along each line of the initial line pattern, since said displacement values would determine precisely how the texture values are to be mapped (column 5, line 68 to column 6, line 7 of Lathrop).

5. Claims 4-5, 9 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lathrop (US Patent 5,097,427) in view of Curry (US Patent 5,696,604) and Arnold (US Patent 5,929,866).

Claims 4-5 disclose the same limitations as claims 13-14, respectively. Claims 4-5 are therefore discussed together with claims 13-14, respectively.

Regarding claims 4 and 13: Lathrop discloses that an initial line pattern is warped based on an original image (column 5, line 68 to column 6, line 7 of Lathrop).

Lathrop in view of Curry does not disclose expressly that said warping of said initial line is based upon a density map extracted from pixel values of the original image.

Arnold discloses creating a density map (figure 1a(30) of Arnold), said density map being extracted from pixel data (column 4, lines 38-44 of Arnold) and at a lower resolution than the image data that said density map represents (column 4, lines 29-33 of Arnold). Adjustments are made to an image based upon either said density map as a whole or upon selected portions of said density map (column 4, lines 51-55 of Arnold).

Lathrop in view of Curry is combinable with Arnold because they are from the same field of endeavor, namely image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to warp the initial pattern line, as taught by Lathrop, based on a density map generated in the manner taught by Arnold. The motivation for doing so would have been to be able to efficiently adjust for fading (column 5, lines 54-58 of Arnold) and prevent aliasing in the output (column 2, lines 19-27 of Arnold). Therefore, it would have been obvious to combine Arnold with Lathrop in view of Curry to obtain the invention as specified in claims 4 and 13.

Further regarding claims 5 and 14: Arnold discloses producing a density map by sampling pixel values of the original image (column 4, lines 29-33 of Arnold). Said density map is created at a lower resolution than the output device, and is thus computed from a plurality of elements (column 4, lines 29-33 of Arnold).

Regarding claim 9: Lathrop discloses that an initial line pattern is warped based on an original image (column 5, line 68 to column 6, line 7 of Lathrop).

Lathrop in view of Curry does not disclose expressly that the initial line pattern is warped by inserting or removing one or more lines between adjacent lines of the initial line pattern.

Arnold discloses producing a density map at a lower resolution than the output device, using a plurality of neighboring pixel values (column 4, lines 29-33 of Arnold). Creating said density map for the output device at the output resolution would therefore inherently require the removal of one or more lines between adjacent lines in order for said density map to be at a lower resolution that the original image.

Lathrop in view of Curry is combinable with Arnold because they are from the same field of endeavor, namely image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to warp the initial pattern line, as taught by Lathrop, based on a density map generated in the manner taught by Arnold. Doing so would then inherently require the warping of the initial line pattern by removing one or more lines between adjacent lines of the initial line pattern, since said density map would be at a lower resolution than the input image data. The motivation for doing so would have been to be able to efficiently adjust for fading (column 5, lines 54-58 of Arnold) and prevent aliasing in the output (column 2, lines 19-27 of Arnold). Therefore, it would have been obvious to combine Arnold with Lathrop in view of Curry to obtain the invention as specified in claim 9.

6. Claims 10-11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lathrop (US Patent 5,097,427) in view of Curry (US Patent 5,696,604) and Smitt (US Patent 5,988,504).

Claims 11 and 19 disclose the same limitations and are therefore discussed together.

Regarding claim 10: Lathrop discloses arithmetically combining the texture pixels, warped onto the X-Y image display space, and the original image pixels (column 5, lines 20-26 and column 7, lines 1-5 of Lathrop), thus mapping the texture data onto the image display space (column 5, line 68 to column 6, line 7 of Lathrop). Since said mapping is an arithmetic combination, said mapping is the same as mapping the original image pixels onto the texture pixel space since the resultant image would be the same in either case.

Lathrop in view of Curry does not disclose expressly that mapping the original image onto the warped line pattern is based upon a comparison of original image pixel values and warped line pattern pixel values.

Smitt discloses using a weighted pixel values (column 4, lines 13-19 of Smitt) taken from an input image (figure 1(4); and column 3, line 66 to column 4, line 4 of Smitt) and using said pixel values as the threshold values for binarizing an image (column 4, lines 45-50 of Smitt). A warped image is inherently a particular type of weighted image, said weighting scheme being based upon the type of image warping desired.

Lathrop in view of Curry is combinable with Smitt because they are from the same field of endeavor, namely halftone image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the warped image data, as taught by Lathrop in view of Curry, as

threshold data with which to compare the original image, as taught by Smitt. This would cause the mapping to be performed based upon a comparison of original image pixel values and warped line pattern pixel values, since said comparison is what occurs during the process of halftoning (column 4, lines 47-50 of Smitt). The motivation for doing so would have been that doing so establishes a halftone thresholding matrix that better compensates for the different characteristics of the input image (column 5, lines 38-44 of Smitt). Therefore, it would have been obvious to combine Smitt with Lathrop in view of Curry to obtain the invention as specified in claim 10.

Regarding claims 11 and 19: Lathrop in view of Curry does not disclose expressly that the original image is mapped onto the warped line pattern by producing black pixel values of the engraving-style image at pixel locations where original image pixel values are less than corresponding warped line pattern pixel values, and producing white pixel values of the engraving-style image at pixel locations where original pixel values are greater than or equal to corresponding warped line pattern pixel values.

Smitt discloses that, if the grayscale value of the original image pixel exceeds the threshold value (warped pixel value), then the output pixel for said original image pixel will be white (column 4, lines 48-50 of Smitt). Otherwise, said output pixel will be black (column 4, line 50 of Smitt).

Lathrop in view of Curry is combinable with Smitt because they are from the same field of endeavor, namely halftone image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to output a white pixel if the original image pixel is greater than the

warped image pixel, said warped image pixel being used as the threshold value as discussed in the arguments regarding claim 10, and output a black pixel otherwise. The motivation for doing so would have been that the aforementioned thresholding scheme is useful for creating the halftone dots needed for sending the required halftone output to a printer (column 4, lines 50-53 of Smitt). Therefore, it would have been obvious to combine Smitt with Lathrop in view of Curry to obtain the invention as specified in claims 11 and 19.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A Thompson whose telephone number is 703-305-6329. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K Moore can be reached on 703-308-7452. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Art Unit 2624

JAT
21 March 2005

THOMAS D.
~~TOMMY~~ LEE
PRIMARY EXAMINER